Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/20129
DOI URL: http://dx.doi.org/10.21474/IJAR01/20129

RESEARCH ARTICLE

NUTRITIONAL SURVEY IN CRITICALLY ILL CHILDREN AND THEIR IMPACT ON ANTHROPOMETRIC INDICES AND OUTCOME

Isha Deshmukh[1], Ketaki Lanjewar[2], Naresh Sonkawade[3] and Aarti Kinikar[4]

1. Corresponding Author, Assistant Professor in Department of Pediatrics, BJGMC and Sassoon General Hospital, Pune.
2. Pediatric Resident, BJGMC, Pune.
3. Naresh Sonkawade Assistant Professor in Department of Pediatrics, MD Pediatrics, BJGMC and Sassoon General Hospital, Pune.
4. Professor and Head of the Department, MD Pediatrics, Department of Pediatrics, BJGMC and Sassoon General Hospital, Pune.

Manuscript Info

Manuscript History
Received: 25 October 2024
Final Accepted: 28 November 2024
Published: December 2024

Key words:-
Pediatrics, Nutrition, Pediatric Critical Care Unit, Anthropometry

Abstract

Malnutrition has a high incidence among patients hospitalized to PICUs. It has a major impact on a child's outcome, including death, morbidity, and length of ICU stay.[1,2,3] During this acute phaseinICU,there is decreased energy and protein delivery to body tissues. So the metabolism shifts to catabolic. Although initially these changes are life saving for the child but as a whole these changes deteriorate the nutritional status of the child. And if it coupled with suboptimal nutrition intake during ICU stay then it leads to significant anthropometric deterioration.'

Objectives:

1.To evaluate incidence of malnutrition in critically ill children admitted to PICU.

2.To find the change in anthropometric indices mainly weight in critically ill children after illness phase in PICU.

3.Impact of enteral nutrition on outcome of child.

Study Design: Prospective observational study conducted in pediatric intensive care unit over a period of 6 months from 1/02/2024 to 31/07/2024.

Results and Conclusions: The findings demonstrated that malnutrition was prevalent among children admitted to PICU. Girl children were especially affected more than boys.Early start of enteral nutrition (within 24 hours) can reduce the overall mortality rates and ICU stay in normal and malnourished children therefore the practice must be encouraged with proper protocols especially in intensive care units.

Limitations of the study: Our current study has limitations that include small sample size, patient heterogenicity, variable disease severity, lack of information on baseline nutritional status and insufficient statistical power for analysis.

Corresponding Author:-Isha Deshmukh
Address**:-**Assistant Professor in Department of Pediatrics, MD Pediatrics, BJGMC and Sassoon General Hospital, Pune.

Introduction:-

Anthropometric evaluation is a simple method to evaluate the nutritional status of a child. It has advantage of being applicable to all patients, it is non invasive and non expensive. But parameters like weight can be affected by variation in composition of body like dehydration and oedema. Other biochemical parameters like cholesterol and lipoproteins, blood sugar levels, pre-albumin, transferrin (all increase with enteral nutrition) were not taken into consideration. The target of this study was to emphasis the importance of early enteral nutrition in children requiring more than 2 days in intensive care unit.Hence after stabilization of acute phase, early nutritional support preferably enteral nutrition should be an integral part of pediatric critical care.4,5

There is scarcity of literature in nutrition inpediatric critical care in India.This study aims to study the incidence of nutrition in pediatric intensive care units and measures to increase nutrition and there impact on outcome.

However various studies have found that the actual delivery of enteral nutrition is less as compared to what is needed due to lack of feeding protocols, delay in initiation and stopping enteral nutrition in case of a procedure or an untoward event.6,7 Covid 19 pandemic has increased both underweight and obesity.

Aims and objectives of the study:

1. To study nutrition in critically ill children and their impact on anthropometric indices and outcome.

Objectives:-

1. To evaluate incidence of malnutrition in critically ill children admitted to PICU.
2. To find the change in anthropometric indices mainly weight in critically ill children after illness phase in PICU.
3. Impact of enteral nutrition on outcome of child.

Methodology:-

Ethics committee approval for the study was obtained. Ours was a prospective cohort study conducted in pediatric intensive care unit.

Inclusion criteria:

1. All children aged 1 month to 12 years admitted in PICU with icu stay ≥ 2 days were enrolled and data collected for 107 patients.

Exclusion criteria:

1. All children aged 1 month to 12 years in PICU with pediatric intensive care unit stay < 2 days
2. Children with conditions contraindicated for enteral nutrition.
3. Children on chronic steroids or diuretics, or with ascites and edema

At an estimated prevalence of 50 % malnutrition at PICU with 10 % error rate and 95% Confidence interval and adjusting 20 % loss to follow up, sample size of 107 was calculated.[1,6]

Data was collected of 107 patients including demographics, weight, PICU length of stay, duration of mechanical ventilation, mortality data, day of starting enteral nutrition(within 48 hours of admission), main system involved in illness. Weight was noted at admission and while shifting out of ICU using WHO and IAP growth charts.[8,9]The end point was discharge from PICU for each patient. The entire data was checked for errors, inconsistencies and omissions.Anthropometric nutrition assessment was performed among enrolled children at PICU admission and discharge. Nutrition status was determined from the Z-scores of weight-for-height(WHZ), weight-for-age (WAZ), length/height-for-age (HAZ), body mass index-for-age (BAZ, for children elder than 5 years), based on the World Health Organization child growth standards (8,9)

Malnutrition was defined for cases in which rates lower than –2 Z scores, whereas severe malnutrition was attributed in cases below –3 Z scores.

Statistical Analysis:
Univariate analysis was performed to assess the independent risk of mortality and extended stay. Categorical variables were compared using chi-square test and continuous parameters were compared using Mann Whiteny μ test since the data was not normally distributed. The analysis was performed using IBM SPPS Statistics Version 20.

Results:-

There were 55 male children and 52 female children. 40.2 % children were in age group > 6 months to 5 yrs.

- Average age was 4.3 ± 3.9 years.
- Youngest patients was 40 days old whereas eldest was 12 yrs old.
- 39.1% children under 6 months showed Failure to thrive.
- 20.9 % in age group 6 months-5 years were MAM and 34.9% were SAM. 43.9% children > 5yrs were underweight or shunted.
- Majority (25%) cases had CNS involvement. It was followed by RS with 22%.
- 8% had anemia and GI involvement each.
- 5% had endocrine disorders and sepsis each.
- Incidence of malnutrition was found to be 52.3% (56/107) at PICU admission. Of 56 malnourished children 34(60.7%) were girls ($p<0.01$) which suggests very high incidence among girl children.
- In other age groups malnourishment was comparable.
- Percentage of mortality was 21.4% in malnourished children compared to 5.9% in normally nourished children which was significantly higher. ($p<0.05$)
- Weight loss during the stay was noted in (91/107) 85% children and it was slightly higher in normal children compared to malnourished. ($p>0.05$)
- We performed univariate analysis and it was found that children (>6 months to ≤ 5 years) having SAM was independent risk factor for mortality with Odd's ratio 6.5.
- Being malnourished (of any type) under 5 years was also an independent risk factor with OR 29.9.
- Being malnourished (of any type) in all age groups was also an independent risk factor with OR 3.57
- Delayed start of enteral nutrition or not starting enteral nutrition was independent risk factor for mortality with OR=9.85.
- Mechanical ventilation with OR 5.21 was also an independent risk factor.

Average stay in ICU (days) was higher in malnourished children, in children who were started enteral nutrition after 24 hours or were not started enteral nutrition at all and the children who survived. However these differences were not statistically significant using non parametric tests.(Mann Whiteny μ test) ($p>0.05$)

Conclusions:-

1. The findings demonstrated that malnutrition was prevalent among children admitted to PICU. Girl children were especially affected more than boys.
2. Moreover, children who were severely ill received delayed enteral nutrition in general resulting in poor outcomes.
3. There was high rate of overall mortality in ICU and increased risk among malnourished in all age groups .
4. Triaging of the patients at PICU is very important and special emphasis on malnourished children be given in resource limited hospitals for improved outcomes.
5. Early start of enteral nutrition (within 24 hours) can reduce the overall mortality rates and ICU stay in normal and malnourished children therefore the practice must be encouraged with proper protocols especially in intensive care units.
6. Delayed start of enteral nutrition or not starting enteral nutrition significantly increased the risk of mortality and insignificant risk of additional stay at ICU.
7. Nutritional assessment on admission to PICU is important to identify at risk patients and limited resources can be directed towards them. There is need of appropriate nutritional protocols in icu. Nutrition support team or a dietician should be available in picu team for optimum nutrient delivery for each patient.
8. Nutrition is generally inadequate in mechanically ventilated children.Intake of a higher percentage of dietary energy via enteral route was associated with improved survival.
9. EN remains the preferred route for nutrient delivery
10. Nutrition support team or a dietician should be available in the PICU team for timely nutrition screening and optimum nutrient delivery for each patient.

11. After initial stabilization of patient,nutritionalrehabilitationis the cornerstone of a positive outcome.Overall mortality was 15/107 (14.01%).
12. Under 5 mortality was (10/66) 15.1% whereas above 5 years it was (5/41) 12.2%.

Acknowledgement:-

We express our sincere gratitude to our Dean – Dr Eknath Pawar, Our head of the department – Dr Aarti Kinikar, all respected faculty , residents and staff nursing involved in patient care in pediatric intensive care unit of BJGMC , Pune.

Conflict of Interest :
None.

References:-

1. Prieto MB, Cid JL. Malnutrition in the critically ill child: the importance of enteral nutrition. Int J Environ Res Public Health. 2011 Nov;8(11):4353-66. doi: 10.3390/ijerph8114353. Epub 2011 Nov 21. PMID: 22163211; PMCID: PMC3228575.
2. Mehta NM, Bechard LJ, Cahill N, et al. Nutritional practices and their relationship to clinical outcomes in critically ill children--an international multicenter cohort study*. Crit Care Med. 2012;40(7):2204-2211. doi:10.1097/CCM.0b013e31824e18a8
3. Moeeni V, Walls T, Day AS. Nutritional status and nutrition risk screening in hospitalized children in New Zealand. Acta Paediatr. 2013 Sep;102(9):e419-23. doi: 10.1111/apa.12299. Epub 2013 Jun 3. PMID: 23692547.
4. Bagri NK, Jose B, Shah SK, Bhutia TD, Kabra SK, Lodha R. Impact of Malnutrition on the Outcome of Critically Ill Children. Indian J Pediatr. 2015 Jul;82(7):601-5. doi: 10.1007/s12098-015-1738-y. Epub 2015 Mar 26. PMID: 25804317.
5. Mehta NM, Bechard LJ, Zurakowski D, Duggan CP, Heyland DK. Adequate enteral protein intake is inversely associated with 60-d mortality in critically ill children: a multicenter, prospective, cohort study. Am J Clin Nutr. 2015 Jul;102(1):199-206. doi: 10.3945/ajcn.114.104893. Epub 2015 May 13. PMID: 25971721; PMCID: PMC4480666
6. Li J, Li B, Qian J, Zhang J, Ren H, Ning B, Wang Y. Nutritional survey in critically ill children: a single center study in China. TranslPediatr. 2020 Jun;9(3):221-230. doi: 10.21037/tp-19-173. PMID: 32775240; PMCID: PMC7347761.
7. Joffe A, Anton N, Lequier L, Vandermeer B, Tjosvold L, Larsen B, Hartling L. Nutritional support for critically ill children. Cochrane Database Syst Rev. 2016 May 27;2016(5):CD005144. doi: 10.1002/14651858.CD005144.pub3. PMID: 27230550; PMCID: PMC6517095.
8. WHO (2013) The WHO child growth standards. Available at http://www.who.int/childgrowth/standards/en/ Accessed 10 Jan 2013
9. Indian Academy of Pediatrics Growth Charts Committee, Khadilkar V, Yadav S, Agrawal KK, Tamboli S, Banerjee M, Cherian A, Goyal JP, Khadilkar A, Kumaravel V, Mohan V, Narayanappa D, Ray I, Yewale V. Revised IAP growth charts for height, weight and body mass index for 5- to 18-year-old Indian children. Indian Pediatr. 2015 Jan;52(1):47-55. doi: 10.1007/s13312-015-0566-5. PMID: 25638185.
10. Mikhailov TA, Gertz SJ, Kuhn EM, Scanlon MC, Rice TB, Goday PS. Early Enteral Nutrition Is Associated With Significantly Lower Hospital Charges in Critically Ill Children. JPEN J Parenter Enteral Nutr. 2018 Jul;42(5):920-925. doi: 10.1002/jpen.1025. Epub 2018 Jan 5. PMID: 30001462.